



## Pinhook Bog

### Summary

Indiana's only true bog is a special geologic feature of this region which preserves a large variety of plants with extraordinary adaptations for survival. See insect eating plants and tamarack trees; walk on a boardwalk that is placed upon a floating mat of sphagnum moss.

### Objectives

Students will be able to:

1. Describe the geologic processes which formed the bog.
2. Describe what conditions are necessary for the bog's continued existence.
3. List three bog plants and explain an adaptation of each one.
4. State the importance of preserving natural habitats such as Pinhook Bog.
5. Describe at least two threats to the bog and how the National Park Service works to protect this unique habitat.



*pink lady's slipper orchid*

### What to Expect During Your Field Trip

1. Group arrives at the Calumet Dune Interpretive Center near Beverly Shores and follows the ranger to Pinhook Bog or meets the ranger at the bog. Please specify when you schedule your program.
2. The program (hike portion) is 90 minutes in length; not including travel time.
3. The bog trail is very short, only about 1/2 of a mile in length. But there are many things to see along the way. Students will be engaged in exploration activities to learn about the special features of the bog.

**Setting:** Pinhook Bog is located south of Michigan City in LaPorte County. The trail is short and most of it is a plastic boardwalk within the bog. This area is closed to visitors unless they are on a scheduled tour. A portable toilet is available on site, but there are no other facilities.

**Grade:** 6<sup>th</sup> - 12<sup>th</sup> grades.

**Ratio of Students to Ranger:** 15 to 1, with only two rangers at a time on site. Please provide one adult chaperone for every ten students for safety purposes.

**Safety Issues:** The trail is a plastic boardwalk which is floating in some areas. Boots and sneakers that can get wet and dirty are recommended. Poison sumac, a tree which can cause an itchy rash upon skin contact, grows in the bog along the trail. Participants will be shown this tree and cautioned to avoid it.

**For More Information:** See the park's education website at [www.nps.gov/indu/forteachers/](http://www.nps.gov/indu/forteachers/). Contact the park's scheduling office at (219) 926-7561, ext. 243.

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## Background Information

What is a bog? - Doug Wilcox, a scientist with the U.S. Geological Survey, who did extensive research at Pinhook Bog, believes it is the only true bog in Indiana. It derives its water from rain and the surrounding small watershed. The impermeable clay layer in the bottom of Pinhook prevents groundwater containing dissolved calcium-bicarbonate from entering the bog and neutralizing the mineral poor, acidic water.

Sphagnum moss plays a central role in developing the acidic water by releasing acid ions. The poorly oxygenated, acidic water is probably the single most important factor in allowing peat to form. This process limits the vegetation to the distinctive species that grow in the bog. (Wilcox, memo) Pinhook's unique environment is the home of 27 rare plants that are on the State of Indiana endangered, threatened, rare, or watch lists. (Stewart, Pavlovic. 1993). Most of these plants are not acid loving; rather they are limited to growing in bogs because of their inability to compete successfully against other species in other environments. (Wilcox, 1982)

How did Pinhook bog form? When the Wisconsin Glacial ice sheet retreated from this area 14,000-15,000 years ago, numerous large ice blocks were buried by the rock debris carried by the glacier..

When the ice blocks melted, they gave rise to several groups of kettle-hole lakes. The ice block that formed Pinhook Bog was grounded in glacial till of sand and clay. This clay layer isolated the kettle-hole lake from the groundwater.

About 4,200 years ago, submerged and floating plants colonized the water just below the surface. (Wilcox, Simonin) The submerged plants limited the wave action allowing reeds and grasses to grow in the shallows. Sphagnum moss filled the open areas between the plants and formed a mat. Utilizing logs and other solid objects, the mat thickened as it extended over the open water. The thickened mat supported herbaceous plants and eventually trees and shrubs.

The dead plant material sloughed from the bottom of the mat cannot decompose in the low oxygen and mineral poor, acidic water. This material transforms into peat at the bottom of the lake. The peat deposits became thick enough to ground the older portions of the mat to the bottom of the shallow portions of the lake. The floating mat continued to grow across the surface of the lake until the open water area was eliminated. The lake water is trapped under the mat. (Wilcox, 1982)



## Prerequisite Classroom Activities

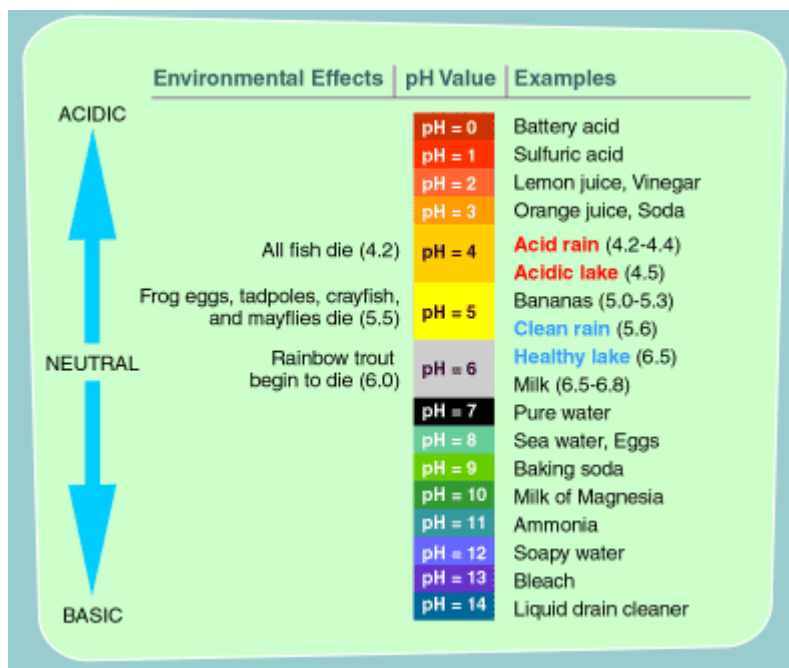
Prior to your visit to Indiana Dunes National Lakeshore, please take a moment to read through the information listed below. We suggest that you do one or more of the described activities with your class in order to prepare them for the lessons and experiences they will have during their field trip.

A list of vocabulary words and plants to research has been provided to prepare students for their visit to the bog. If there is a special topic or area that you want the ranger to cover during the presentation, please contact the park's scheduling office, and every effort will be made to accommodate your request.

### SCIENCE ACTIVITY

Materials: Small potted plants, orange juice, paper for recording observations, aquariums, aquarium filter system and litmus paper.

- Experiment with the pH scale, testing common items with litmus paper. Some examples of items to test would be tap water, vinegar, ammonia, lemon juice or a water and baking soda solution. Have students read their results. Compare the results of their tests to the pH scale provided and discuss the types of environments that are healthy for certain organisms.
- Take some small living plants and water them for a few weeks with orange juice to simulate the pH of the bog water. Keep a few plants which are only given water as the control group.
- Have the students keep a record of the plants' growth, measuring size, observing general appearance, etc. Again use the pH scale included in this packet to discuss the effects of low pH on plant life.



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## Plants Common to Pinhook Bog to Research

Did you know that over 14 of 28 species of sphagnum moss found in Indiana are in the bog, and 3 of those 28 species are only found in Pinhook? Ask students to select a species and find out more interesting facts about these curious plants.

pitcher plant (*Sarracenia purpurea*)  
bladderwort (*Utricularia geminiscapa*)  
round-leaved sundew (*Drosera rotundifolia*)  
rusty cotton grass (*Eriophorum virginicum*)  
orange fringed orchid (*Habenaria ciliaris*)  
white pine (*Pinus strobus*)  
pink lady's slipper (*Cypripedium acaule*)  
poison sumac (*Rhus vernix*)  
mountain holly (*Nemopanthus mucronata*)  
downy highbush blueberry (*Vaccinium atrococcum*)  
large cranberry (*Vaccinium macrocarpon*)  
small cranberry (*Vaccinium oxycoccos*)  
tamarack (*Larix laricina*)  
buttonbush (*Cephalanthus occidentalis*)  
sphagnum moss (*Sphagnum*)



*sundew at Pinhook Bog*

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## Vocabulary

**BOG** - (see “What Is A Bog” under Background Information)

**GLACIER** - a large body of ice moving slowly down a slope or valley or spreading outward on a land surface. Usually carrying, pushing, or depositing loose rock and other debris and eroding land forms along the way. The perennial snowfield, on which falling snow is converted to a granular icy mass through the pressure of successive snowfalls and through the freezing of seasonal meltwater becomes solid ice, and flows plastically downward to form the body of the glacier. This grows or shrinks according to whether snowfall exceeds the rate of melting or not.

**KETTLE LAKE** - a steep-sided lake without surface drainage especially in a deposit of glacial drift.

**ADAPTATION** - something that a plant or animal has or does that enables it to survive.

**CARNIVOROUS PLANT** – a plant which subsists on nutrients obtained from the breakdown of animal protoplasm.

**DECOMPOSE** - to cause chemical disintegration of organic matter

**pH** - used in convenience in expressing both acidity and alkalinity usually on a scale of 0 to 14 on which 7 represents the value for pure water at neutrality. Values less than 7 represent increasing hydrogen-ion concentration and increasing acidity. Values greater than 7 represent decreasing hydrogen-ion concentration and increasing alkalinity.

**MORaine** - any glacially formed accumulation of unconsolidated debris which can occur in currently glaciated and formerly glaciated regions, such as those areas acted upon by a past ice age.



## Follow-up Activity

Ask each student to write a short essay, letter or story about what they learned on their field trip to Indiana Dunes National Lakeshore. Rangers love receiving mail from their students. Send the ranger the packet of essays from your class (or a copy of them), and your ranger will send your class a certificate from the dunes. Send your essays to: **Indiana Dunes National Lakeshore, 1100 N. Mineral Springs Road, Porter, IN 46304, Attn: Your ranger's name or just Education Department**

If you are using this essay as a class assignment for a grade, we would like to suggest that each essay contain the following elements. **Use the rubric below to score them.**

- The name of the park and the location of their field trip—for example: Douglas Center, Indiana Dunes National Lakeshore
- Three facts they learned on the field trip about the ecology of Pinhook Bog.
- A brief explanation of why Indiana Dunes is unique and therefore a national park.
- At least two things the student can do to help take care of his or her national park.
- Fill in the blank of this statement and provide an explanation: I would like to learn more about \_\_\_\_\_ at Indiana Dunes.

## Assessment: Rubric for Class reflection writing assignment:

Elements	4 points	3 points	2 points	1 point
Writing and organization	The writing sample is very well written and organized by the elements provided. It has a strong introduction, middle and conclusion.	The writing sample is well written and organized by the elements provided. It includes an introduction, middle and conclusion.	The writing sample is choppy and is not well organized. It lacks an introduction or conclusion.	The writing sample is very short and unorganized.
Grammar & Spelling	Mistakes in spelling and grammar are minor or non-existent.	Mistakes in spelling and grammar are minimal—about 4-5.	Mistakes in spelling and grammar are numerous—5-10.	Mistakes in spelling and grammar are more than 10.
Facts and content	The writing sample demonstrates the student's learning on the dunes program and includes three or more facts provided by the park staff.	The writing sample demonstrates the student's learning and includes only two facts provided by the park staff.	The writing sample does not demonstrate much learning and only includes one fact provided by the park staff.	The writing sample does not demonstrate any learning and does not include any facts provided by the park staff.
National Park Service theme	The writing sample clearly demonstrates the student's understanding of the role of the NPS in preserving the dunes by explaining why Indiana Dunes is such a unique treasure.	The writing sample mentions the NPS and its role in preserving the Indiana Dunes.	The writing sample mentions the NPS and Indiana Dunes.	The writing sample does not mention anything about the NPS or its role at Indiana Dunes.
Stewardship	The writing sample lists three things the student can do to assist in taking care of the Indiana Dunes.	The writing sample lists two things the student can do to assist in taking care of the Indiana Dunes.	The writing sample lists one thing the student can do to assist in taking care of the Indiana Dunes.	The writing sample does not list anything about what the student can do to take care of the Indiana Dunes.

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# Indiana Science Content Standards

The *Pinhook Bog* program can assist teachers in meeting the following Indiana standards in science.

## **6th grade**

- 6.1.4 Give examples of employers who hire scientists, such as colleges and universities, businesses and industries, hospitals, and many government agencies.
- 6.1.5 Identify places where scientists work, including offices, classrooms, laboratories, farms, factories and natural field settings ranging from space to the ocean floor.
- 6.4.8 Explain that in all environments, such as freshwater, marine, forest, desert, grassland, mountain, and others, organisms with similar needs may compete with one another for resources, including food, space, water, air and shelter. Note that in any environment, the growth and survival of organisms depend on the physical conditions.

## **7th grade**

- 7.1.8 Explain that technologies often have drawbacks as well as benefits. Consider a technology, such as the use of pesticides, which helps some organisms but may hurt others, either deliberately or inadvertently.
- 7.3.7 Give examples of some changes in Earth's surface that are abrupt, such as earthquakes and volcanic eruptions, and some changes that happen very slowly, such as uplift and wearing down of mountains and the action of glaciers.
- 7.3.13 Explain that many substances dissolve in water. Understand that the presence of these substances often affects the rates of reactions that are occurring in the water as compared to the same reactions occurring in the water in the absence of the substances.
- 7.3.16 Recognize and explain that different ways of obtaining, transforming, and distributing energy have different environmental consequences.

## **8th grade**

- 8.3.6 Understand and explain that the benefits of Earth's resources, such as fresh water, air, soil, and trees, are finite and can be reduced by using them wastefully or by deliberately or accidentally destroying them.
- 8.4.4 Describe how matter is transferred from one organism to another repeatedly and between organisms and their physical environment.
- 8.4.8 Describe how environmental conditions affect the survival of individual organisms and how entire species may prosper in spite of the poor survivability or bad fortune of individuals.

## **High School Environmental Science**

- Env.1.1 Know and describe how ecosystems can be reasonably stable over hundreds or thousands of years. Consider as an example the ecosystem of the Great Plains prior to the advent of the horse in Native American Plains societies, from then until the advent of agriculture, and well into the present.
- Env.1.4 Understand and explain that human beings are part of Earth's ecosystems and give examples of how human activities can, deliberately or inadvertently, alter ecosystems.

- Env.1.6 Describe and give examples about how the decisions of one generation both provide and limit the range of possibilities open to the next generation.
- Env.1.7 Recognize and explain that in evolutionary change, the present arises from the materials of the past and in ways that can be explained, such as the formation of soil from rocks and dead organic matter.
- Env.1.10 Identify and measure biological, chemical, and physical factors within an ecosystem.
- Env.1.12 Explain the process of succession, both primary and secondary, in terrestrial and aquatic ecosystems.
- Env.1.27 Understand and describe the concept of integrated natural resource management and the values of managing natural resources as an ecological unit.

### **High School Biology**

- B.1.32 Explain how natural selection leads to organisms that are well suited for survival in particular environments, and discuss how natural selection provides scientific explanation for the history of life on Earth as depicted in the fossil record and in the similarities evident within the diversity of existing organisms.
- B.1.40 Understand and explain that like many complex systems, ecosystems tend to have cyclic fluctuations around a state of rough equilibrium. However, also understand that ecosystems can always change with climate changes or when one or more new species appear as a result of migration or local evolution.
- B.1.41 Recognize that and describe how human beings are part of Earth's ecosystems. Note that human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems.
- B.1.43 Understand that and describe how organisms are influenced by a particular combination of living and nonliving components of the environment.  
Earth and Space Science:

### **High School Earth Science**

- ES.1.17 Describe the development and dynamics of climatic changes over time, such as the cycles of glaciation.
- ES.1.20 Describe the relationship among ground water, surface water, and glacial systems.